



SMART INDIA HACKATHON



**SMART INDIA
HACKATHON
2022**

Ministry/Organization Name/Student Innovation: Department of Space, Indian Space Research Organisation

PS Code: SS612

Problem Statement Title: Prediction of TEC Variations with Artificial Intelligence using Space Weather Data as input

Team Name: AZTECH ALURE

Team Leader Name: GAYATRI CHIPPI

Institute Code (AISHE):

Problem Category: Software

Theme Name: Disaster Management



अंतरिक्ष विभाग
DEPARTMENT OF
SPACE

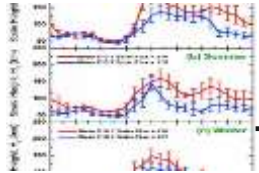
सत्यमेव जयते



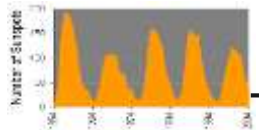
PROTOTYPE



Get data of Solar Flares using public sources & prepare dataset



Get F10.7 data, Interplanetary Data & Magnetic field at Geomagnetic Equator



Get Sunspot Cycle (Seasonal & Diurnal) with Geographical Location (Polar, Aurora zones)



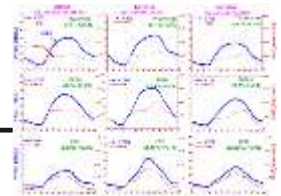
Get Solar Storm interval from public domain & prepare Dataset



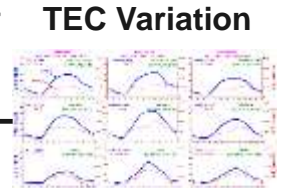
Input Geographical Location



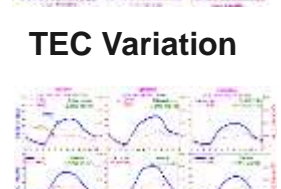
Predict the TEC variation with Solar Storm Interval acc. to Season using Naive Bayes & Decision Tree



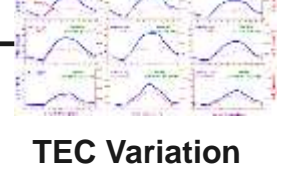
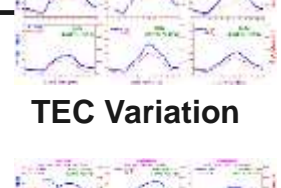
Predict the TEC variation with F10.7 & Magnetic Field & Location using XGBOOSTER Algorithm



Predict the TEC variation with Location & Solar Flare using LSTM model



Predict the TEC variation with combined effect using Neural Network



NAIVE BAYES

Predict the TEC variation with Solar Storm interval according to Season

XG BOOSTER

Predict the TEC variation with F10.7 & Magnetic Field & Location

LSTM

Predict the TEC variation with Location & Solar Flare

NEURAL NETWORK

Predict the TEC variation with combined effect



DATABASE

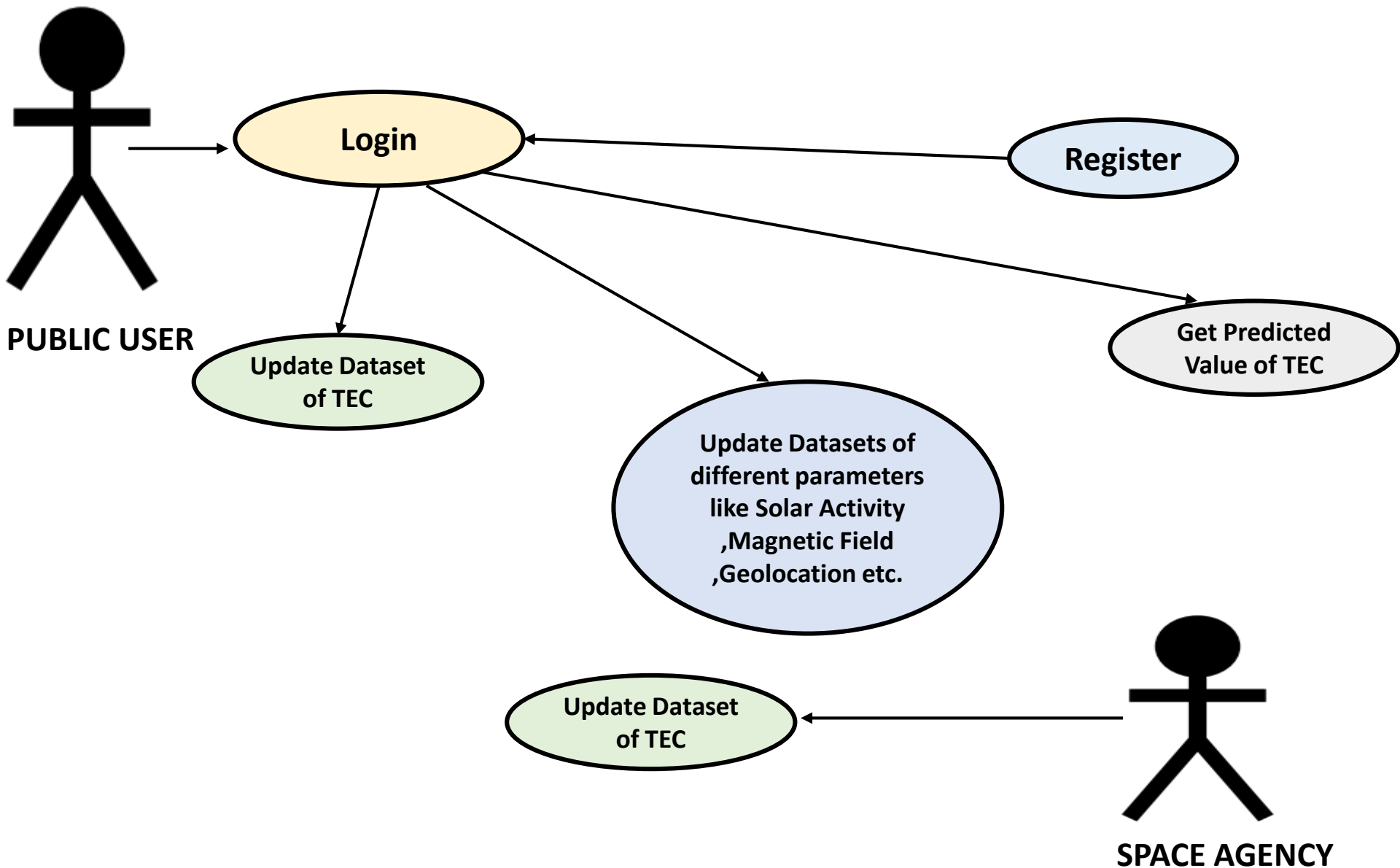


Test dataset



Training dataset

USE CASE

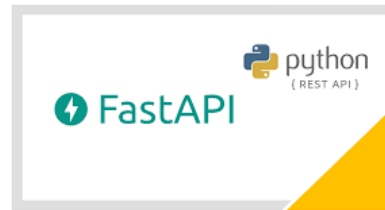


SOLUTION APPROACH



- First of all we are developing the solution for **Prediction of TEC(Total Electron Count)** using **Deep Learning Models-AI(Artificial Intelligence)**.
 - We are developing the web application that is developed using **Django framework** and **HTML CSS** for showing the predicted value of TEC.
 - First we prepared the data set of TEC **with input parameters like Solar Flare, Solar Storm. Interval, F10.7, Interplanetary Data, GNSS Signal Delay, Magnetic Field for the desired location.**
 - First we will **input geographical location.**
 - Predict the **TEC variation with Solar Storm Interval according to Season** using **Naive Bayes& Decision Tree.**
 - Predict the **TEC variation with F10.7 & Magnetic Field & Location** using **XGBooster.**
- ### **Algorithm**
- Predict the **TEC variation with Location & Solar Flare** using **LSTM model.**
 - Predict the **TEC variation with combined effect** using **Neural Network.**

TECHNOLOGY STACK



Keras



PyTorch

DEPENDENCIES /SHOW STOPPERS

- Large dataset required
- Accuracy is not 100%
- Depend on the ML model